PATENT //2/

OIPE 403	IN THE UNITED STATES PATENT AND TRADEMARK OFFICE (MBHB Case No. 05-720-US3)			
ME In res	application of:	)		
STEAT & TRACEHER	Kouvetakis, et al.	) Examiner: To Be Assigned		
Serial	No.: 10/559,980	) Group Art Unit: 2812		
Filed:	December 8, 2005	) Confirmation No. 6555		
For:	Method for preparing ge1-x-ysnxey (e=p, as, sb) semiconductors and related si-ge-sn-e and si-ge-e analogs	) ) )		

## TRANSMITTAL LETTER

Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

In regard to the above identified application:

1. We are transmitting herewith the attached:

☐ Transmittal Letter (1 sheet)
 ☐ Information Disclosure Statement (IDS) (11 sheets);
 ☐ IDS Form 1449 (13 sheets);
 ☐ 123 Cited References (Copies of references 13-123 are enclosed herewith);
 ☐ Return Receipt Postcard.

Return Receipt Postcard.

2. With respect to fees:

No fee is required

- 3. Please charge any additional fees or credit overpayment to Deposit Account No. 13-2490.
- 4. CERTIFICATE OF MAILING BY "EXPRESS MAIL" UNDER 37 CFR § 1.10: The undersigned hereby certifies that this Transmittal Letter and the papers, as described hereinabove, are being deposited with the United States Postal Service with sufficient postage as "Express Mail Post Office to Addressee" in a box addressed to: PO Box 1450, Alexandria, VA 22313-1450, on this 20th day of December, 2006. Express Mail No. EV840507818US.

Respectfully submitted,

By: David S. Harper

Reg. No. 42,636

**PATENT** 

# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE (Case No. 05-720-US3) n the Application of: 2812 Kouvetakis et al. **Art Unit:** Serial No.: 10/559,980 To be assigned **Examiner: December 8, 2005** Filed: Confirmation No. 6555 For: Method for Preparing ge1-x-ysnxey (e=p, as, sb)) Semiconductors and related si-ge-sn-e and si-ge-e analogs )

# INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

Dear Sir:

Pursuant to 37 C.F.R. Section 1.97 - 1.99, the Applicant wishes to make the following references of record in the above-identified application. This Information Disclosure Statement is in compliance with the continuing duty of candor as set forth in 37 C.F.R. Section 1.56. Copies of the references cited below are enclosed. These references are also listed on the enclosed PTO Form 1449.

In the judgment of the undersigned, portions of the listed references may be material to the Examiner's consideration of the presently pending claims. However, the references have not been reviewed in sufficient detail to make any other representation and, in particular, no representation is intended as to the relative relevance between references, whether cited in this or prior statements. This statement is not a representation that the listed references have effective dates early enough to be "prior art" within the meaning of 35 U.S.C. Section 102 or Section 103.

I mis I	mormai	ion Disclosure Statement is being fried.
$\boxtimes$	date o	three months of the filing date of a national application; within three months of the f entry into the national stage as set forth in 37 C.F.R. § 1.491 in an international ation; or before the mailing date of a first Office Action on the merits. 37 C.F.R. §1.97
	nation mailin Action	three months of the filing date of a national application, or the date of entry into the al stage as set forth in 37 C.F.R. § 1.491 in an international application; or <b>after</b> the g date of a first Office Action on the merits, but <b>before</b> the mailing date of a Final a under 37 C.F.R. § 1.113 or a Notice of Allowance under 37 C.F.R. § 1.311 never occurs first), and includes (37 C.F.R. § 1.97 (c):
		the Certification under 37 C.F.R. § 1.97(e) (see "Certification" below)
		OR
		the fee of \$180.00 set forth in 37 C.F.R. § 1.17(p) (see "Fees" below).
	1.311 fee, an the Per below) Statem	a Final Action under 37 C.F.R. § 1.113 or a Notice of Allowance under 37 C.F.R. § (whichever occurs first), but before, or simultaneously with, the payment of the issue id includes the Certification under 37 C.F.R. § 1.97(e) (see "Certification" below), and tition Fee set forth in 37 C.F.R. § 1.17(i) (see "Fees" and "Method of Payment of Fees" and "Applicants hereby petitions for consideration of the Information Disclosure tent submitted herewith and the accompanying references in examination of the subject application.
<u>CERT</u>	IFICAT	<u> ION</u>
	Disclo counte	ndersigned hereby certifies that each item of information contained in the Information sure Statement was cited in a communication from a foreign patent office in a rpart foreign patent application not more than three months prior to the filing of the lation Disclosure Statement.
	Disclo counte certific	ndersigned hereby certifies that no item of information contained in the Information sure Statement was cited in a communication from a foreign patent office in a rpart foreign patent application or, to the knowledge of the person signing the ration after making reasonable inquiry, was known to any individual designated in 37 § 1.56(c) more than three months prior to the filing of the Information Disclosure tent.

X \( \)	No fee is owed by the applicant(s). The IDS Fee of \$180.00 under 37 C.F.R. § 1.17(p) is enclosed herewith.
<u>METH</u>	OD OF PAYMENT OF FEES
	Attached is a check in the amount of \$180.00

CERTIFICATE OF MAILING VIA EXPRESS MAIL DELIVERY under 37 C.F.R. § 1.10. I hereby certify that the attached paper of fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" Service under 37 C.F.R.§ 1.10 on the date indicated above and is addressed to Commissioner for Patents, Box 1450, Alexandria, VA, 22313-1450, on this 20<sup>th</sup> day of December, 2006. Express Mail No. EV840507818US.

Respectfully submitted,

David S. Harper

Registration No. 42,636

### **United States Patents**

- 1. Murthy, et al., U.S. Publication No. US 2003-0157787 A1, Published on August 21, 2003.
- 2. Kouvetakis, et al., U.S. Publication No. US 2006-0134895 A1, Published on June 22, 2006.
- 3. Kouvetakis, et al., U.S. Publication No. US 2006-0236923 A1, Published on October 26, 2006.
- 4. Kouvetakis, et al., U.S. Publication No. US 2006-0163612-A1, Published on July 27, 2006.
- 5. Kouvetakis, et al., U.S. Patent No. 6,911,084, Issued on June 28, 2005.
- 6. Sugawara, et al., U.S. Patent No. 5,532,183, Issued on July 2, 1996.
- 7. Tang, et al., U.S. Patent No. 5,198,387, Issued on March 30, 1993.
- 8. Oguro, U.S. Patent No.: 5,714,415, Issued on February 3, 1998.
- 9. Mani, U.S. Patent No.: 6,410,434, Issued on June 25, 2002.
- 10. Cordone, et al., U.S. Patent No.: 6,723,621 B1, Issued on April 20, 2004.
- 11. Soref, et al., U.S. Patent No.: 6,897,471, Issued on May 24, 2005.
- 12. Doppalapudi, et al., U.S. Patent No.: 6,441,716, Issued on August 27, 2002.

## **Foreign Documents**

- 13. PCT Patent Publication No. WO 2005/001902, published January 6, 2005.
- 14. PCT Patent Publication No. WO 2004/114368, published December 29, 2004.
- 15. PCT Patent Publication No. WO 2005/015609, published February 17, 2005.
- 16. PCT Patent Publication No. WO 2003/033781, published April 24, 2003.
- 17. PCT Patent Publication No. WO 2006/009171, published January 26, 2006.

#### Other Documents

- 18. D. W. Jenkins, "Electronic properties of metastable GexSn1-x alloys", Phys. Rev. B., Vol. 36, pp. 7994-8001 (1987).
- 19. K. A. Mader, "Band structure and instability of GexSn1-x alloys", Solid State Commun., Vol: 69 (12), pp. 1123-1126 (1989).
- 20. G. He and H.A. Atwater, "Interband transitions in Sn<sub>x</sub>Ge<sub>1-x</sub> Alloys", Phys. Rev. Lett., Vol. 79(10), pp. 1937-1940 (1997).
- 21. O. Gurdal, R. Desjardins, J. R. A. Carlsson, N. Taylor, H. H. Radamson, J.-E. Sundgren, and J. E. Greene, "Low-temperature growth and critical epitaxial thicknesses of fully strained metastable Ge1-x Snx (x ≤0.26) alloys", J. Appl. Phys., Vol: 83(1), pp. 162-170 (1998).
- 22. M. T. Asom, E. A. Fitzgerald, A. R. Kortan, B. Spear, and L. C. Kimerling, "Epitaxial Growth of SnGe Alloys", Appl. Phys. Lett., Vol. 55(6), pp. 578-580 (1989).
- 23. H. Höchst, M. A. Engelhardt, and D. W. Niles, "The MBE growth and electronic structure of α-Sn<sub>x</sub>Ge<sub>1-x</sub> alloys", SPIE Proceedings, Vol: 1106, pp. 165-171 (1989)(ABSTRACT).
- 24. C. A. Hoffman, et al., "Three-Band transport and cyclotron resonance in alpha Sn and alpha Sn<sub>1-x</sub>Ge<sub>x</sub> grown by molecular-beam epitaxy", Phys. Rev. B. Vol: 40(17): pp. 11693-11700, (1989).
- 25. W. Wegscheider, K. Eberl, U. Menczigar, and G. Abstreiter, "Single-crystal Sn/Ge superlattices on Ge substrates: Growth and structural properties", Appl. Phys. Lett., Vol. 57(9), pp. 875-877 (1990).
- 26. O. Gurdal, et al., "Growth of metastable Ge<sub>1-x</sub>Sn<sub>x</sub>/Ge stratined layer superlattices on Ge(001)2x1 by temperature-modulated molecular beam epitaxy", Appl. Phys. Lett., Vol: 67(7), pp. 956-958 (1995).
- 27. P. R. Pukite, A. Harwit, and S. S. Iyer, "Molecular beam epitaxy of metastable, diamond structure Sn<sub>x</sub>Ge<sub>1-x</sub> alloys", Appl. Phys. Lett. 54(21), pp. 2142-2144 (1989).

- 28. M. Bauer, et al., "Ge-Sn semiconductors for band-gap and lattice engineering", Appl. Phys. Lett. 81(16), pp. 2992-2994 (2002).
- 29. L. Bellaiche, S.-H. Wei and Z. Zunger, "Localization and percolation in semiconductor alloys: GaAsN vs GaAsP", Phys. Rev. B 54, 17568-17576 (1996).
- 30. J. Taraci, J. Tolle, M. R. M. Cartney, J. Menendez, M. A. Santana, D. J. Smith, and J. Kouvetakis, "Simple chemical routes to diamond-cubic germanium-tin alloys", App. Phys. Lett. 78(23), pp. 3607-3609 (2001).
- 31. J. Taraci, S. Zollner, M. R. McCartney, J. Menéndez, M. A. Santana, D. J. Smith, A. Haaland, A. V. Tutukin, G. Gundersen, G. Wolf, and J. Kouvetakis, "Synthesis of silicon-based infrared semiconductors in the Ge-Sn system using molecular chemistry methods", J. of the Am. Chem. Soc., Col: 123(44), pp. 10980-10987 (2001).
- 32. V. Atluri, N. Herbots, D. Dagel, H. Jacobsson, M. Johnson, R. Carpio, and B. Fowler, "Comparison and reproducibility of H-passivation of Si(1000) with HF in methanol, ethanol, isopropanol and water by IBA, TMAFM, and FTIR", Mater. Res. Soc. Symp. Proc. 477, pp. 281-292 (1997) (ABSTRACT).
- 33. Z. Charafi and N. Bouarissa, "The effect of the violation of Vegard's law on the optical bowing in Si<sub>1-x</sub>Ge<sub>x</sub> alloys", Phys. Lett. A. Vol: 234, pp. 493-497 (1997).
- 34. H. Kajiyama, S-I. Muramatsu, T. Shimada, and Y. Nishino, "Bond-length relaxation in crystalline Si<sub>1-x</sub>Ge<sub>x</sub>alloys: An extended x-ray-absorption fine-structure study", Phys. Rev. B Vol: 45(24), pp. 14005-14010 (1992).
- 35. F. Cerdeira, W. Dreyrodt, and M. Cardona, "Resonant raman scattering in germanium", Solid State Commun., Vol. 10, 591-595 (1972).
- 36. M.M. McGibbon, N.D. Browning, M.F. Chisholm, A.J. McGibbon, S.J. Pennycook, V. Ravikumar, V.P. Dravid, "Direct determination of grain boundary atomic structure in SrTio<sub>3</sub>" Science, Vol: 266, pp. 102-104 (1994).
- 37. P. Mock, T. Topuria, N. D. Browning, G. R. Booker, N. J. Mason, R. J. Nicholas, M. Dobrowolska, S. Lee, and J. K. Furdyna, "Internal self-ordering in In(Sb,As), (In,Ga) Sb, and (Cd,Zn,Mn) Se nano-agglomerates/quantum dots", Appl. Phys. Lett., Vol: 79(7), pp. 946-948. (2001).
- 38. D.M. Ceperley, B.J. Alder, "Ground State of the Electron Gas by Stochastic Method", Phys. Rev. Lett., Vol: 45, pp. 566-569 (1980).
- 39. T G. Kresse and J. Hafner, "Ab initio molecular dynamics for liquid metals", Phys. Rev. B47(1), pp. R558-561 (1993).
- 40. G. Kresse and J. Hafner, "Ab ignition molecular-dynamics simulation of the liquid-metal-amorphous-semiconductor transition in germanium", Phys. Rev. B49(20), pp. 14251-14269 (1994).
- 41. G. Kresse, J. Furthmuller, "Efficiency of ab-initio total energy calculations for metals and semiconductors using a plane-wave basis set", Comput. Mater. Sci. Vol. 6, pp. 15-50 (1996).

- 42. G. Kresse, J. Furthmuller, "Efficient iterative schemes for ab initio total-energy calculations using a plane-wave basis set", Phys. Rev. B54(16), pp. 11169-11186 (1996).
- 43. R. A. Soref and L. Friedman, "Direct-gap Ge/GeSn/Si and GeSn/Ge/Si heterostructures", Superlattices and Microstructures, Vol: 14(2), 189-193 (1993).
- 44. M. R. Bauer, J. Kouvetakis, D.J. Smith and J. Menendez, "Tunable band structure in diamond cubic tin germanium alloys grown on Si", Solid State Commun., Vol. 127, 355-359 (2003).
- 45. M.R. Bauer, P. Crozier, A.V.G Chizmeshya and J. D. Smith and J. Kouvetakis, "GeSn superstructured materials for Si-based optoelectronics", Appl. Phys. Lett. Vol. 83, pp. 3489-3491 (2003).
- 46. M. Bauer et al., "Tunable band structure in diamond-cubic tin-germanium alloys grown on silicon substrates", Solid State Communications, Vol. 127 (2003), pp. 355-359.
- 47. S. Cradock, E. A. V. Ebsorth, G. Davidson, L. A. Woodard, "Studies in Germyl Chemistry.3. Trigermylphosphine", J. Chem. Soc. A, 8, pp. 1229-1233 (1967).
- 48. D. W. H. Rankin, A. G. E. Robiet, G. M. Sheldrick, 5 Beagley, T. G. Hewit, "An electron Diffraction of the Molecular Structures of Trigermylphosphine and Trisilylstibine in the Gas Phase" J. Inorg. Nucl. Chem., 31, pp. 2351-2357 (1969).
- 49. E. A. V. Ebsworth, D. J. Hutchison, D. W. H. Rankin, "The Preparation, properties, and Gas-Phase Molecular-Structure of 1,1- Difluoro-2,2-Digermylbiphosphone", J. Chem. Res., Synop, 12, pp. 393, (1980).
- 50. E. A. V. Ebsworth, D. W. H. Rankin, G. M. Sheldrick, "Preparation and Properties of Trigermyl-arsine and -stibine", J. Chem. Soc. A, 11, pp. 2828-2830 (1968).
- 51. D. E. Wingeleth, A. D. Norman, "Redistribution of primary silyl-and germylphosphines; synthesis of trisilyl-and trigermylphosphines", Phosphorus Sulfur, 39(1-2), pp. 123-129, (1988).
- 52. G. A. Forsyth, D. W. H. Rankin, H. E. Robertson, "Determination of the molecular structure of Tris (Trimethylsilyl) phosphine in the gas phase by electron diffraction, supported by molecular mechanics calculations", J. Mol. Struct., Vol. 239, pp. 209-217, (1990).
- 53. H. Schumann, H. J. Kroth, "NMR-Untersuchungen an Organoelemmenten(IVb)-Phosphinen, 2. Substituenteneinflusse auf die P-chemischen Verschiebungen von Trimethylelement (IVb)-phosphinen", Z. Naturforsch., B: Anorg. Chem., Chem. 32B, pp. 513-515, (1977).
- 54. G. Becker, H. Freudenblum, O. Mundt, M. Reti, M. Sachs, Synthetic Methods of Organometallic and Inorganic Chemistry, 3, pp. 193-198 (1996).
- 55. S. Schulz, M. Nieger, "Synthesis and characterization of organogallium-antimony compounds", J. of Organomet. Chem., Vol: 570, pp. 275-278 (1998).
- 56. H. Schumann, U. Frank, W. W. Du Mont, F. Marschner, "Organometallarsine", J. Organomet. Chem, Vol: 222, pp. 217-225 (1981).

- 57. M. Ates, H. J. Breunig, M. Denker, "Formation of (Me<sub>3</sub>M)<sub>3</sub>Sb (M = Ge, Sn, Pb) and (Me<sub>3</sub>M)<sub>4</sub>Sb<sub>2</sub> (M = Pb) by reaction of (Me<sub>3</sub>Si)<sub>3</sub>Sb with Me<sub>3</sub>MCI", Phosphous, Sulfur Silicon Relate. Elem., Vol: 102, pp. 287-289 (1995).
- 58. H. Schumann, A. Roth, O. Stelzer, M. Schmidt, "Pyramidenformige Molekule Mit Dem Atomskelett", Inorg. Nucl. Chem. Lett. 2, pp. 311-312, (1986).
- 59. G. Davidson, L. A. Woodward, E. A. V. Ebsworth, G. M. Sheldrick, "The vibrational spectra and structure of trisilylarsine and trisilylstibine", Spectrochim. Acta, Part A, Vol. 23, pp. 2609-2616, (1967).
- 60. B. Beagley, A. G. Robiette, G. M. Sheldrick, "The Molecular Structures of (SiH3)3P and (SiH3)3As", Chem. Commun, 12, pp. 601-602 (1967).
- 61. Blake, E. A. V. Ebsworth, S. G. D. Henderson, "Structure of trisilylphosphine, P(SiH<sub>3</sub>)<sub>x</sub>, at 100 K", Acta Crystallogr., Sect. C: Cryst. Struct. Commun, C47, pp. 486-489, (1991).
- 62. H. Siebert, J. Eints, "Neuvermessung des schwingungsspektrums von trisilylphosphin", J. Mol. Struct. Vol: 4, pp. 23-28, (1969).
- 63. D. C. McKean, "On the spectroscopic evidence for geometry in (SiH<sub>3</sub>)<sub>3</sub>P and (SiH<sub>3</sub>)<sub>3</sub> As", Spectrochim. Acta, Part A, Vol: 24A, pp. 1253-1254 (1968).
- 64. J. E. Drake, J. Simpson, "Reactions of Monosilylarsine with Some Boron Lewis Acids and the Reaction of Monosilylphosphine with Boron Tribromide", J. Chem. Soc. A. 5, pp. 1039-1043 (1968).
- 65. E. H. Parker and T. E. Whall, "SiGe heterostructure CMOS circuits and applications", Solid State Electronics 43(8), pp. 1497-1506 (1999).
- 66. R. A. Soref and C. H. Perry, "Predicted band gap of the new semiconductor SiGeSn", J. Appl. Phys. 69, pp. 539-541 (1991).
- 67. K. A. Johnson and N. W. Ashcroft, "Electronic structure of ordered silicon alloys: Direct-gap systems", Phys. Rev. B 54, pp. 14480-14486 (1996).
- 68. R. Kost, in Infrared-Applications-of-Semiconductors-II. Symposium, (Mater. Res. Soc., 1998). pp. 3-10 (ABSTRACT).
- 69. W. Bett, F. Dimroth, G. Stollwerck, and O. V. Sulima, "III-V compounds for solar cell applications", Appl. Phys. A: materials Science & Processing, Vol. 69(2), pp. 119-129 (1999).
- 70. R. Gaska, A. Zukauskas, M. S. Shur, and M. A. Khan, "Progress in III-nitride based white light sources", Proceedings of the SPIE, Vol. 4776, pp. 82-96 (2002).
- 71. R. Bauer, C. Ritter, P. Crozier, J. Menendez, J. Ren, and J. Kouvetakis, "Synthesis of ternary Si-Ge-Sn semiconductors on Si(100) via SnxGe1-x buffer layers", Appl. Phys. Lett. 83 (11), 2163-2165 (2003).
- 72. H.K. Shin, D.J. Lockwood, J.-M. Baribeau, "Strain in coherent-wave SiGe/Si superlattices", Solid State Commun., Vol: 114(10), pp. 505-510 (2000).

- 73. M. Meléndez-Lira, J. D. Lorentzen, J. Menéndez, W. Windl, N. Cave, R. Liu, J. W. Christiansen, N. D. Theodore, and J. J. Candelaria, "Microscopic carbon distribution in Si 1- vC<sub>v</sub> alloys: A Raman scattering study", Phys. Rev. B 56, pp. 3648-3650 (1997).
- 74. C.S. Cook, S. Zollner, M.R. Bauer, P. Aella, J. Kouvetakis, and J. Menendez, "Optical constants and interband transitions of Ge<sub>1-x</sub>Sn<sub>x</sub> alloys (x < 0.2) grown on Si by UHV-CVD", Thin Solid Films 455-456, pp. 217-221 (2004).
- 75. Chizmeshya, et al., "Experimental and Theoretical study of deviations from Vegards Law in the Ge<sub>1-x</sub> Ge<sub>1-x</sub> system", Chem. Of Matls., Vol. 15, pp. 2511-2519 (2003).
- 76. Aella, et al., "Structural and optical properties of Sn<sub>x</sub>Si<sub>y</sub>Ge<sub>1-x-y</sub> alloys", App. Phys. Lett. Vol: 84, pp. 888-890 (2004).
- 77. Roucka, et al., "Versatile buffer layer architectures based on Ge<sub>1-x</sub>Sn<sub>x</sub> alloys", Appl. Phys. Let. Vol: 86(19), pp. 191912-191914 (2005).
- 78. He, et al., "Synthesis of expitaxial Sn<sub>x</sub>Ge<sub>1-x</sub> alloy films by ion-assisted molecular beam epitaxy", App. Phys. Lett., Vol: 68(5), pp. 664-666 (1996).
- 79. Pristovsek, et al., "Growth of strained gaAsSb layers on GaAs (001) by MOVPE", Journal of Crystal Growth, Vol: 276, pp. 347-353 (2005).
- 80. Wosinski, et al., "Deep levels caused by misfit dislocations in gaAsSb/GaAs heterostructures", Appl. Phys. Lett., Vol: 67(8), pp. 1131-1133.
- 81. Dvorak, et al., "300 GHz InP/GaAsSb/InP double HBTs with high current capability and BVCEO < 6V", IEEE Electron Device Letters, Vol: 22(8), pp. 361-363 (2001).
- 82. Ryu Sang-Wan, et al., "Optical characterization and determination of conduction band offset of type-II GaAsSb/InGaAs QW", Semiconductor Science and Technology, Vol. 19, pp. 1369-1372 (2004).
- 83. Dowd, et al., "Long wavelength GaAsP/GaAs/GaAsSb VCSELs on GaAs substrates for communication applications", Electronics Letters, Vol. 39(13), pp. 987-988 (2003).
- 84. Zheng, et al., "Demonstration of High-Speed staggered lineup GaAsSb-InP Unitraveling Carrier Photodiodes", IEEE Photonics Technology Letters, Vol. 17(3), pp. 651-653 (2005).
- 85. Sun, et al., "GaAsSb: a novel material for near infrared photodetectors on GaAs substrates", Selected Topics in Quantum Electronics, IEEE Journal, Vol. 8(4), pp. 817-822 (2002).
- 86. Kaniewski J., et al., "Resonant cavity enhanced InGaAs photodiodes for high speed detection of 1.55 μm infrared radiation", Proceedings of SPIE-The International Society for Optical Engineering (2005), Vol: 5783 (Pt. 1, Infrared Technology and Applications XXXI), pp. 47-56.
- 87. Kang, Y., et al., "InGaAs-on-Si single photon avalanche photodetectors", Applied Physics Letters (2004), 85(10), pp. 1668-1670.
- 88. Kim S., et al., "High Performance 0.1μm GaAs Pseudomorphic High Electron Mobility Transistors with Si Pulse-Doped Cap Layer for 77GHz Car Radar Applications", Jpn. J. App. Phys. 44, pp. 2472–2475 (2005).

- 89. Cristea P., et al., "Growth of AlAsSb/InGaAs MBE-layers for all-optical switches", J. Cryst. Growth 278(1-4), pp. 544-547 (2005).
- 90. Li Y.J., et al., "Improved characteristics of metamorphic InAlAs/InGaAs high electron mobility transistor with symmetric graded In<sub>x</sub>Ga<sub>1-x</sub>As channel", J. of Vac. Sci. Tech. B **22**(5), pp. 2429-2433 (2004).
- 91. Mao R. W., et al., "Fabrication of 1.55 μm Si-Based Resonant Cavity Enhanced Photodetectors Using Sol-Gel Bonding" IEEE Photonics Technology Letters 16(8), pp. 1930-1932 (2004).
- 92. Pauchard A., et al., "Wafer-bonded InGaAs/silicon avalanche photodiodes", Proceedings of SPIE-The International Society for Optical Engineering, Vol. 4650 (Photodetector Materials and Devices VII), pp. 37-43 (2002).
- 93. Takano Y., et al., "Residual strain and threading dislocation density in InGaAs layers grown on Si substrates by metalorganic vapor-phase epitaxy", Appl. Phys. Lett., Vol. 78(1), pp. 93-95 (2001).
- 94. Chriqui Y., et al., "Long wavelength room temperature laser operation of a strained InGaAs/GaAs quantum well structure monolithically grown by metalorganic chemical vapour deposition on a low energy-plasma enhanced chemical vapour deposition graded misoriented Ge/Si virtual substrate", Optical Materials, Vol. 27, pp. 846–850 (2005).
- 95. V.K. Yang, et al., "Comparison of luminescent efficiency of InGaAs quantum well structures grown on Si, GaAs, Ge, and SiGe virtual substrate", J. Appl. Phys., Vol. 93(9), pp. 5095-5102 (2003).
- 96. Shiu Fai Li, et al., "Scaling law for the compositional dependence of Raman frequencies in GeSi and SnGe alloys, Appl. Phys. Lett., Vol. 84, pp. 867-869 (2004).
- 97. Cook, et al., "Optical constants and interband transitions of Ge1-xSnx alloys (x<0.2) grown on Si", In press Thin Solid Films, Vol: 455-456, pp. 217-221 (2004).
- 98. Menendez, et al., "Type-I Ge/Ge<sub>1-x-y</sub> Si <sub>x</sub>Sn<sub>y</sub> strained-layer heterostructures with a direct Ge band gap, Appl. Phys. Lett., Vol: 85(7), pp. 1175-1177 (2004).
- 99. Park, et al., "Observation olarge stark shift in Ge<sub>x</sub>Si<sub>1-x</sub> /Si multiple quantum wells", J. Cac. Sci. Technol. B, Vol: 8(2), pp. 217-220 (1990).
- 100. Baier, et la., "Type-II band alignment in Si/Sil\_xGex quantum wells from photoluminescence line shifts due to optically induced band-bending effects: Experiment and theory", Phys. Rev. B, Vol: 50(20), pp. 15191-15196 (1994).
- 101. Temkin, et al., "GexSi1-x strained-layer superlattice waveguide photodetectors operating near 1.3 \_m", Appl. Phys. Lett., Vol: 48(15), pp. 963-965 (1986).
- 102. Li, et al., (2000), "Observation of quantum-confined stark shifts in SiGe/Si type-I multiple quantum wells", J. Appl. Phys. Vol. 87(11), pp. 8195-8197.
- 103. Miyake, et al., "Absence of stark shift in strained Si1-xGex/Si type-I quantum wells", Appl. Phys. Lett., Vol; 68(15), pp. 2097-2099 (1996).

- 104. O. Qasaimeh, et al., (1997), "Electroabsorption and Electrooptic Effectin SiGe-Si Quantum Wells: Realization of Low-Voltage Optical Modulators", IIEEE J. Quantum Electron, Vol. 33 (99), pp. 1532-1536.
- 105. Jaros, "Simple analytic model for heterojunction band offsets", Phys. Rev. B. Vol. 37(12), pp. 7112-7114 (1988).
- 106. Tolle, et al., "Epitaxial growth of group III nitrides on Si substrates via a reflective lattice-matched zirconium diboride buffer layer", Appl. Phys. Lett., Vol. 82(15), pp. 2398-2400 (2003).
- 107. Hu, et al., "Nucleation and growth of epitaxial ZrB<sub>2</sub>(0001) on Si(111)", Journal of Crystal Growth, Vol: 267, (2004) pp. 554-563.
- 108. Tolle, et al., "Epitaxial growth of AlGaN by metalorganic chemical vapor deposition on Si(111) via a ZrB<sub>2</sub>(0001) buffer layer", Appl. Phys. Lett, Vol: 84(18), pp. 3510-3512 (2004).
- 109. R.F.C. Farrow et al., "The growth of metastable, heteroepitaxial films of  $\alpha$ -Sn by metal beam epitaxy", J. Cryst. Growth, Vol. 54, pp. 507-518 (1981).
- 110. G Becker et al., "Notiz uber eine einfache methode zur darstellung von tris (trimethylsilyl)phosphin", Chem. Ber., Vol. 108, pp. 2484-2485 (1975).
- 111. H. Schumann et al., "Trimethylsilyldiphosphane", J. Organomet. Chem., Vol. 88, pp. C13-C16, (1975).
- 112. H. Schumann et al., "Eine einfache Methode zur Synthese von Organosilylphosphinen", J. Organometalic Chem. Vol: 55, pp. 257-260 (1973).
- 113. H. Burger et al., "Schwingungsspektren und Kraftkonstanten von Silyl-und Trimethylsilyl-Verbindungen von Elementen der 5. Gruppe", Spectrochimica. Acta, Vol. 26A, pp. 671-683, (1970).
- 114. H.J. Breunig et al., "Crystal structures of tris (trimethylsilyl) stibine and pentacarbonyl(tris(trimethylsilyl) stibine) chromium", Journal of Organometallic Chemistry, Vol. 608 (2000), pp. 60-62.
- 115. L. Rosch et al., "Darstellung und untersuchung von phosphinkomplexen mit aluminiumtrichlorid und aluminiumtriathyl", Anorg. Allg. Chem, Vol: 426, pp. 99-106 (1976).
- 116. H. Schumann et al., "Substituentenaustauschreaktionene zwischen Tris (Trimethylsilyl) phosphan und Trimethylgermanium- und Trimethylzinnchlorid", Z. Naturforsch., Vol:29B, 608-610 (1974).
- 117. H. Schumann et al., "Darstellung und Schwingungsspektren von Trimethylsilyl-, Trimethylgermyl-und Trimethyl-stannyl-tert-butylphosphinen", Chem. Ber., Vol. 107, pp. 854-869 (1974).
- 118. A.V.G. Engelhardt et al. Naturforsch., "Uber die IR-, Raman-und <sup>31</sup>P-NMR-Spektren einiger phosphinderivate von germanium und zinn", B: Anorg. Chem., Org. Chem., Biochem, Biophys., Biol. Vol: 22b, pp. 352-353 (1967).

119. J.W. Anderson, J.E. Drake, "Trimethylstannylarsines", Canadian Journal of Chemistry, Vol. 49, pp. 2524-2528 (1971).

120. E. Niecke, H. Westermann, "A simple method for the preparation of Tris (trimethylsilyl) phosphine", Synthesis, (1988), page 330.

phosphine, Synthesis, (1988), page 330.

121. H.J. Breunig et al., Naturforsch., "Tetrakis (Trimethylsilyl) distiban", Z. Naturforsch., Vol:

34B, pp. 926-928 (1979).

122. H.J. Breunig, "Synthese von Tetrakis (trimethylgermyl)-Distaiban", Z. Naturforsch., Vol. 33B,

pp. 244-245, (1978).

123. Spanier, et al., "The Synthesis of Germylsilane from Silane and German in a Silent Electric

Discharge", Inorganic Chemistry, (1962), pp. 215-216.

Commonly owned Co-Pending Applications:

1. Kouvetakis, et al., U.S. Patent Application No. 10/559,981, Filed on December 8, 2005.

2. Kouvetakis, et al., U.S. Patent Application No. 10/559,979, Filed on December 8, 2005.

In accordance with MPEP Sections 609 and 707.05(b), it is requested the document cited

(including any cited in applicant's specification which is not repeated on the attached Form PTO-

1449) be given thorough consideration and that it be cited of record in the prosecution history of the

present application by initialing on Form PTO-1449. Such initialing is requested even if the

Examiner does not consider a cited document to be sufficiently pertinent to use in a rejection, or

otherwise does not consider it to be prior art for any reason, or even if the Examiner does not believe

that the guidelines for citation have been fully complied with. This is requested so that each

document becomes listed on the face of the patent issuing on the present application.

Date: / 2/20/06

By:

//

David \$. Harper Reg. No. 42,636

Respectfully submitted,

McDonnell, Boehnen Hulbert & Berghoff LLP

300 South Wacker Drive, Suite #3100

Chicago, IL 60606

11

2812

**December 8, 2005** 

FORM PTO-1449 (Rev. 2-32)	Patent and Trademark Office	Atty. Docket No.	Serial No.
		05-720-US3	10/559,980
OFE 403	INFORMATION DISCLOSURE STATEMENT BY APPLICANT		
TEL 2 0 2006 W	(Use several sheets if necessary)	Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:

## **U.S. PATENT DOCUMENTS**

Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	1.	US 2003-0157787 A1	August 21, 2003	Murthy, et al.			
	2.	US 2006-0134895 A1	June 22, 2006	Kouvetakis, et al.			
	3.	US 2006-0236923 A1	October 26, 2006	Kouvetakis, et al.			
	4.	US 2006-0163612-A1	July 27, 2006	Kouvetakis, et al.			
	5.	6,911,084	June 28, 2005	Kouvetakis, et al.			
	6.	5,532,183	July 2, 1996	Sugawara, et al.			
	7.	5,198,387	March 30, 1993	Tang, et al.			
	8.	5,714,415	February 3, 1998	Oguro			
	9.	6,410,434	June 25, 2002	Mani			
	10.	6,723,621	April 20, 2004	Cordone, et al.			
	11.	6,897,471	May 24, 2005	Soref, et al.			
	12.	6,441,716	August 27, 2002	Doppalapudi, et al.			

EXAMINER	DATE CONSIDERED
<u> </u>	
'	

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office		Atty. Docket No.	Serial No.
		05-720-US3	10/559,980	
	INFORMATION DISCL STATEMENT BY APP			
	(Use several sheets if ne	ecessary)		
		Applicant:		
			Kouvetakis, et al.	
			Filing Date:	Group:
			December 8, 2005	2812

## **FOREIGN PATENT DOCUMENTS**

Examiner Initial		Document Number	Date	Country	Class	Subclass	Trans	lation
							Yes	No
	13.	WO 2005/001902	January 6, 2005	PCT				
	14.	WO 2004/114368	December 29, 2004	PCT				
	15.	WO 2005/015609	February 17, 2005	PCT				
	16.	WO 2003/033781	April 24, 2003	PCT				
	17.	WO 2006/009171	January 26, 2006	PCT				

# OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc).

Examiner Initial		
	18.	D. W. Jenkins, "Electronic properties of metastable GexSn1-x alloys", Phys. Rev. B., Vol. 36, pp. 7994-8001 (1987).
	19.	K. A. Mader, "Band structure and instability of GexSn1-x alloys", Solid State Commun., Vol: 69 (12), pp. 1123-1126 (1989).
	20.	G. He and H.A. Atwater, "Interband transitions in Sn <sub>x</sub> Ge <sub>1-x</sub> Alloys", Phys. Rev. Lett., Vol. 79(10), pp. 1937-1940 (1997).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(Rev. 2-32)		05-720-US3	10/559,980
	INFORMATION DISCLOSURE STATEMENT BY APPLICANT		
	(Use several sheets if necessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

21.	O. Gurdal, R. Desjardins, J. R. A. Carlsson, N. Taylor, H. H. Radamson, JE. Sundgren, and J. E. Greene, "Low-temperature growth and critical epitaxial thicknesses of fully strained metastable Ge1-x Snx (x ≤0.26) alloys", J. Appl. Phys., Vol: 83(1), pp. 162-170 (1998).
22.	M. T. Asom, E. A. Fitzgerald, A. R. Kortan, B. Spear, and L. C. Kimerling, "Epitaxial Growth of SnGe Alloys", Appl. Phys. Lett., Vol: 55(6), pp. 578-580 (1989).
23.	H. Höchst, M. A. Engelhardt, and D. W. Niles, "The MBE growth and electronic structure of $\alpha$ -Sn <sub>x</sub> Ge <sub>1-x</sub> alloys", SPIE Proceedings, Vol: 1106, pp. 165-171 (1989)(ABSTRACT).
24.	C. A. Hoffman, et al., "Three-Band transport and cyclotron resonance in alpha –Sn and alpha –Sn <sub>1-x</sub> Ge <sub>x</sub> grown by molecular-beam epitaxy", Phys. Rev. B. Vol: 40(17): pp. 11693-11700, (1989).
25.	W. Wegscheider, K. Eberl, U. Menczigar, and G. Abstreiter, "Single-crystal Sn/Ge superlattices on Ge substrates: Growth and structural properties", Appl. Phys. Lett., Vol: 57(9), pp. 875-877 (1990).
26.	O. Gurdal, et al., "Growth of metastable Ge <sub>1-x</sub> Sn <sub>x</sub> /Ge stratined layer superlattices on Ge(001)2x1 by temperature-modulated molecular beam epitaxy", Appl. Phys. Lett., Vol: 67(7), pp. 956-958 (1995).
27.	P. R. Pukite, A. Harwit, and S. S. Iyer, "Molecular beam epitaxy of metastable, diamond structure Sn <sub>x</sub> Ge <sub>1-x</sub> alloys", Appl. Phys. Lett. 54(21), pp. 2142-2144 (1989).
28.	M. Bauer, et al., "Ge-Sn semiconductors for band-gap and lattice engineering", Appl. Phys. Lett. 81(16), pp. 2992-2994 (2002).
29.	L. Bellaiche, SH. Wei and Z. Zunger, "Localization and percolation in semiconductor alloys: GaAsN vs GaAsP", Phys. Rev. B 54, 17568-17576 (1996).
30.	J. Taraci, J. Tolle, M. R. M. Cartney, J. Menendez, M. A. Santana, D. J. Smith, and J. Kouvetakis, "Simple chemical routes to diamond-cubic germanium-tin alloys", App. Phys. Lett. 78(23), pp. 3607-3609 (2001).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(Nev. 2-32)	ratent and Trademark Office	05-720-US3	10/559,980
INFORMATION DISC STATEMENT BY API			
(Use several sheets if r	necessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

31.	J. Taraci, S. Zollner, M. R. McCartney, J. Menéndez, M. A. Santana, D. J. Smith, A. Haaland, A. V. Tutukin, G. Gundersen, G. Wolf, and J. Kouvetakis, "Synthesis of silicon-based infrared semiconductors in the Ge-Sn system using molecular chemistry methods", J. of the Am. Chem. Soc., Col: 123(44), pp. 10980-10987 (2001).
32.	V. Atluri, N. Herbots, D. Dagel, H. Jacobsson, M. Johnson, R. Carpio, and B. Fowler, "Comparison and reproducibility of H-passivation of Si(1000) with HF in methanol, ethanol, isopropanol and water by IBA, TMAFM, and FTIR", Mater. Res. Soc. Symp. Proc. 477, pp. 281-292 (1997) (ABSTRACT).
33.	Z. Charafi and N. Bouarissa, "The effect of the violation of Vegard's law on the optical bowing in Si <sub>1-x</sub> Ge <sub>x</sub> alloys", Phys. Lett. A. Vol: 234, pp. 493-497 (1997).
34.	H. Kajiyama, S-I. Muramatsu, T. Shimada, and Y. Nishino, "Bond-length relaxation in crystalline Si <sub>1</sub> . <sub>x</sub> Ge <sub>x</sub> alloys: An extended x-ray-absorption fine-structure study", Phys. Rev. B Vol: 45(24), pp. 14005-14010 (1992).
35.	F. Cerdeira, W. Dreyrodt, and M. Cardona, "Resonant raman scattering in germanium", Solid State Commun., Vol: 10, 591-595 (1972).
36.	M.M. McGibbon, N.D. Browning, M.F. Chisholm, A.J. McGibbon, S.J. Pennycook, V. Ravikumar, V.P. Dravid, "Direct determination of grain boundary atomic structure in SrTio <sub>3</sub> " Science, Vol: 266, pp. 102-104 (1994).
37.	P. Mock, T. Topuria, N. D. Browning, G. R. Booker, N. J. Mason, R. J. Nicholas, M. Dobrowolska, S. Lee, and J. K. Furdyna, "Internal self-ordering in In(Sb,As), (In,Ga) Sb, and (Cd,Zn,Mn) Se nanoagglomerates/quantum dots", Appl. Phys. Lett., Vol. 79(7), pp. 946-948. (2001).
38.	D.M. Ceperley, B.J. Alder, "Ground State of the Electron Gas by Stochastic Method", Phys. Rev. Lett., Vol. 45, pp. 566-569 (1980).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(Nev. 2-32)	ratesit and Trademark Office	05-720-US3	10/559,980
INFORMATION DISCL STATEMENT BY APP			
(Use several sheets if n	ecessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

39.	T G. Kresse and J. Hafner, "Ab initio molecular dynamics for liquid metals", Phys. Rev. B47(1), pp. R558-561 (1993).
40.	G. Kresse and J. Hafner, "Ab ignition molecular-dynamics simulation of the liquid-metal-amorphous-semiconductor transition in germanium", Phys. Rev. B49(20), pp. 14251-14269 (1994).
41.	G. Kresse, J. Furthmuller, "Efficiency of ab-initio total energy calculations for metals and semiconductors using a plane-wave basis set", Comput. Mater. Sci. Vol: 6, pp. 15-50 (1996).
42.	G. Kresse, J. Furthmuller, "Efficient iterative schemes for ab initio total-energy calculations using a planewave basis set", Phys. Rev. B54(16), pp. 11169-11186 (1996).
43.	R. A. Soref and L. Friedman, "Direct-gap Ge/GeSn/Si and GeSn/Ge/Si heterostructures", Superlattices and Microstructures, Vol: 14(2), 189-193 (1993).
44.	M. R. Bauer, J. Kouvetakis, D.J. Smith and J. Menendez, "Tunable band structure in diamond cubic tin germanium alloys grown on Si", Solid State Commun., Vol: 127, 355-359 (2003).
45.	M.R. Bauer, P. Crozier, A.V.G Chizmeshya and J. D. Smith and J. Kouvetakis, "GeSn superstructured materials for Si-based optoelectronics", Appl. Phys. Lett. Vol: 83, pp. 3489-3491 (2003).
46.	M. Bauer et al., "Tunable band structure in diamond-cubic tin-germanium alloys grown on silicon substrates", Solid State Communications, Vol: 127 (2003), pp. 355-359.
47.	S. Cradock, E. A. V. Ebsorth, G. Davidson, L. A. Woodard, "Studies in Germyl Chemistry.3. Trigermylphosphine", J. Chem. Soc. A, 8, pp. 1229-1233 (1967).
48.	D. W. H. Rankin, A. G. E. Robiet, G. M. Sheldrick, 5 Beagley, T. G. Hewit, "An electron Diffraction of the Molecular Structures of Trigermylphosphine and TrisilyIstibine in the Gas Phase" J. Inorg. Nucl. Chem., 31, pp. 2351-2357 (1969).

EXAMINER	DATE CONSIDERED

Sheet 6 of 13

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(Nev. 2-32)	ratent and Trademark Office	05-720-US3	10/559,980
INFORMATION DIS STATEMENT BY A			
(Use several sheets	if necessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

49.	E. A. V. Ebsworth, D. J. Hutchison, D. W. H. Rankin, "The Preparation, properties, and Gas-Phase Molecular-Structure of 1,1- Difluoro-2,2-Digermylbiphosphone",J. Chem. Res., Synop, 12, pp. 393, (1980).
50.	E. A. V. Ebsworth, D. W. H. Rankin, G. M. Sheldrick, "Preparation and Properties of Trigermyl-arsine and –stibine", J. Chem. Soc. A, 11, pp. 2828-2830 (1968).
51.	D. E. Wingeleth, A. D. Norman, "Redistribution of primary silyl-and germylphosphines; synthesis of trisilyl-and trigermylphosphines", Phosphorus Sulfur, 39(1-2), pp. 123-129, (1988).
52.	G. A. Forsyth, D. W. H. Rankin, H. E. Robertson, "Determination of the molecular structure of Tris (Trimethylsilyl) phosphine in the gas phase by electron diffraction, supported by molecular mechanics calculations", J. Mol. Struct., Vol. 239, pp. 209-217, (1990).
53.	H. Schumann, H. J. Kroth, "NMR-Untersuchungen an Organoelemmenten(IVb)-Phosphinen, 2. Substituenteneinflusse auf die P-chemischen Verschiebungen von Trimethylelement (IVb)-phosphinen", Z. Naturforsch., B: Anorg. Chem., Chem. 32B, pp. 513-515, (1977).
54.	G. Becker, H. Freudenblum, O. Mundt, M. Reti, M. Sachs, Synthetic Methods of Organometallic and Inorganic Chemistry, 3, pp. 193-198 (1996).
55.	S. Schulz, M. Nieger, "Synthesis and characterization of organogallium-antimony compounds", J. of Organomet. Chem., Vol. 570, pp. 275-278 (1998).
56.	H. Schumann, U. Frank, W. W. Du Mont, F. Marschner, "Organometallarsine", J. Organomet. Chem, Vol. 222, pp. 217-225 (1981).
57.	M. Ates, H. J. Breunig, M. Denker, "Formation of (Me <sub>3</sub> M) <sub>3</sub> Sb (M = Ge, Sn, Pb) and (Me <sub>3</sub> M) <sub>4</sub> Sb <sub>2</sub> (M = Pb) by reaction of (Me <sub>3</sub> Si) <sub>3</sub> Sb with Me <sub>3</sub> MCI", Phosphous, Sulfur Silicon Relate. Elem., Vol: 102, pp. 287-289 (1995).
58.	H. Schumann, A. Roth, O. Stelzer, M. Schmidt, "Pyramidenformige Molekule Mit Dem Atomskelett", Inorg. Nucl. Chem. Lett. 2, pp. 311-312, (1986).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(1.07. 2.02)	Tatolit alla Tadolitali Ollioc	05-720-US3	10/559,980
	FORMATION DISCLOSURE TATEMENT BY APPLICANT		
(Us	e several sheets if necessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

59.	G. Davidson, L. A. Woodward, E. A. V. Ebsworth, G. M. Sheldrick, "The vibrational spectra and structure of trisilylarsine and trisilylstibine", Spectrochim. Acta, Part A, Vol. 23, pp. 2609-2616, (1967).
60.	B. Beagley, A. G. Robiette, G. M. Sheldrick, "The Molecular Structures of (SiH3)3P and (SiH3)3As", Chem. Commun, 12, pp. 601-602 (1967).
61.	A. Blake, E. A. V. Ebsworth, S. G. D. Henderson, "Structure of trisilylphosphine, P(SiH <sub>3</sub> ) <sub>x</sub> , at 100 K", Acta Crystallogr., Sect. C: Cryst. Struct. Commun, C47, pp. 486-489, (1991).
62.	H. Siebert, J. Eints, "Neuvermessung des schwingungsspektrums von trisilylphosphin", J. Mol. Struct. Vol: 4, pp. 23-28, (1969).
63.	D. C. McKean, "On the spectroscopic evidence for geometry in (SiH <sub>3</sub> ) <sub>3</sub> P and (SiH <sub>3</sub> ) <sub>3</sub> As", Spectrochim. Acta, Part A, Vol: 24A, pp. 1253-1254 (1968).
64.	J. E. Drake, J. Simpson, "Reactions of Monosilylarsine with Some Boron Lewis Acids and the Reaction of Monosilylphosphine with Boron Tribromide", J. Chem. Soc. A. 5, pp. 1039-1043 (1968).
65.	E. H. Parker and T. E. Whall, "SiGe heterostructure CMOS circuits and applications", Solid State Electronics 43(8), pp. 1497-1506 (1999).
66.	R. A. Soref and C. H. Perry, "Predicted band gap of the new semiconductor SiGeSn", J. Appl. Phys. 69, pp. 539-541 (1991).
67.	K. A. Johnson and N. W. Ashcroft, "Electronic structure of ordered silicon alloys: Direct-gap systems", Phys. Rev. B 54, pp. 14480-14486 (1996).
68.	A. R. Kost, in Infrared-Applications-of-Semiconductors-II. Symposium, (Mater. Res. Soc., 1998). pp. 3-10 (ABSTRACT).
69.	A. W. Bett, F. Dimroth, G. Stollwerck, and O. V. Sulima, "III-V compounds for solar cell applications", Appl. Phys. A: materials Science & Processing, Vol. 69(2), pp. 119-129 (1999).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(NGV. 2-32)	ratem and Trademark Office	05-720-US3	10/559,980
INFORMATION DISCL STATEMENT BY APP			
(Use several sheets if no	ecessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

70.	R. Gaska, A. Zukauskas, M. S. Shur, and M. A. Khan, "Progress in III-nitride based white light sources", Proceedings of the SPIE, Vol: 4776, pp. 82-96 (2002).
71.	R. Bauer, C. Ritter, P. Crozier, J. Menendez, J. Ren, and J. Kouvetakis, "Synthesis of ternary Si-Ge-Sn semiconductors on Si(100) via SnxGe1-x buffer layers", Appl. Phys. Lett. 83 (11), 2163-2165 (2003).
72.	H.K. Shin, D.J. Lockwood, JM. Baribeau, "Strain in coherent-wave SiGe/Si superlattices", Solid State Commun., Vol: 114(10), pp. 505-510 (2000).
73.	M. Meléndez-Lira, J. D. Lorentzen, J. Menéndez, W. Windl, N. Cave, R. Liu, J. W. Christiansen, N. D. Theodore, and J. J. Candelaria, "Microscopic carbon distribution in Si 1-yCy alloys: A Raman scattering study", Phys. Rev. B 56, pp. 3648-3650 (1997).
74.	C.S. Cook, S. Zollner, M.R. Bauer, P. Aella, J. Kouvetakis, and J. Menendez, "Optical constants and interband transitions of Ge <sub>1-x</sub> Sn <sub>x</sub> alloys (x < 0.2) grown on Si by UHV-CVD", Thin Solid Films 455-456, pp. 217-221 (2004).
75.	Chizmeshya, et al., "Experimental and Theoretical study of deviations from Vegards Law in the Ge <sub>1-x</sub> Ge <sub>1-x</sub> system", Chem. Of Matls., Vol: 15, pp. 2511-2519 (2003).
76.	Aella, et al., "Structural and optical properties of Sn <sub>x</sub> Si <sub>y</sub> Ge <sub>1-x-y</sub> alloys", App. Phys. Lett. Vol: 84, pp. 888-890 (2004).
77.	Roucka, et al., "Versatile buffer layer architectures based on $Ge_{1-x}Sn_x$ alloys", Appl. Phys. Let. Vol. 86(19), pp. 191912-191914 (2005).
78.	He, et al., "Synthesis of expitaxial Sn <sub>x</sub> Ge <sub>1-x</sub> alloy films by ion-assisted molecular beam epitaxy", App. Phys. Lett., Vol: 68(5), pp. 664-666 (1996).  Pristovsek, et al., "Growth of strained gaAsSb layers on GaAs (001) by MOVPE", Journal of Crystal Growth, Vol: 276, pp. 347-353 (2005).
79.	Pristovsek, et al., "Growth of strained gaAsSb layers on GaAs (001) by MOVPE", Journal of Crystal Growth, Vol: 276, pp. 347-353 (2005).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office		Serial No.
(Nev. 2-32)	Faterit and Frademark Only	05-720-US3	10/559,980
	INFORMATION DISCLOSURE STATEMENT BY APPLICANT		
	(Use several sheets if necessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

80.	Wosinski, et al., "Deep levels caused by misfit dislocations in gaAsSb/GaAs heterostructures", Appl. Phys. Lett., Vol: 67(8), pp. 1131-1133.
81.	Dvorak, et al., "300 GHz InP/GaAsSb/InP double HBTs with high current capability and BVCEO < 6V", IEEE Electron Device Letters, Vol. 22(8), pp. 361-363 (2001).
82.	Ryu Sang-Wan, et al., "Optical characterization and determination of conduction band offset of type-II GaAsSb/InGaAs QW", Semiconductor Science and Technology, Vol: 19, pp. 1369-1372 (2004).
83.	Dowd, et al., "Long wavelength GaAsP/GaAs/GaAsSb VCSELs on GaAs substrates for communication applications", Electronics Letters, Vol. 39(13), pp. 987-988 (2003).
84.	Zheng, et al., "Demonstration of High-Speed staggered lineup GaAsSb-InP Unitraveling Carrier Photodiodes", IEEE Photonics Technology Letters, Vol: 17(3), pp. 651-653 (2005).
85.	Sun, et al., "GaAsSb: a novel material for near infrared photodetectors on GaAs substrates", Selected Topics in Quantum Electronics, IEEE Journal, Vol. 8(4), pp. 817-822 (2002).
86.	Kaniewski J., et al., "Resonant cavity enhanced InGaAs photodiodes for high speed detection of 1.55 μm infrared radiation", Proceedings of SPIE-The International Society for Optical Engineering (2005), Vol: 5783 (Pt. 1, Infrared Technology and Applications XXXI), pp. 47-56.
87.	Kang, Y., et al., "InGaAs-on-Si single photon avalanche photodetectors", Applied Physics Letters (2004), 85(10), pp. 1668-1670.
88.	Kim S., et al., "High Performance 0.1µm GaAs Pseudomorphic High Electron Mobility Transistors with Si Pulse-Doped Cap Layer for 77GHz Car Radar Applications", Jpn. J. App. Phys. <b>44</b> , pp. 2472–2475 (2005).
89.	Cristea P., et al., "Growth of AlAsSb/InGaAs MBE-layers for all-optical switches", J. Cryst. Growth 278(1-4), pp. 544-547 (2005).
90.	Li Y.J., et al., "Improved characteristics of metamorphic InAlAs/InGaAs high electron mobility transistor with symmetric graded In <sub>x</sub> Ga <sub>1-x</sub> As channel", J. of Vac. Sci. Tech. B <b>22</b> (5), pp. 2429-2433 (2004).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 U.S. Department of Commerce (Rev. 2-32) Patent and Trademark Office	Atty. Docket No.	Serial No.	
(Nev. 2-32)	Fatent and Trademark Office	05-720-US3	10/559,980
	INFORMATION DISCLOSURE STATEMENT BY APPLICANT		
	(Use several sheets if necessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

91.	Mao R. W., et al., "Fabrication of 1.55 μm Si-Based Resonant Cavity Enhanced Photodetectors Using Sol-Gel Bonding" IEEE Photonics Technology Letters <b>16</b> (8), pp. 1930-1932 (2004).
92.	Pauchard A., et al., "Wafer-bonded InGaAs/silicon avalanche photodiodes", Proceedings of SPIE-The International Society for Optical Engineering, Vol. <b>4650</b> (Photodetector Materials and Devices VII), pp. 37-43 (2002).
93.	Takano Y., et al., "Residual strain and threading dislocation density in InGaAs layers grown on Si substrates by metalorganic vapor-phase epitaxy", Appl. Phys. Lett., Vol: <b>78</b> (1), pp. 93-95 (2001).
94.	Chriqui Y., et al., "Long wavelength room temperature laser operation of a strained InGaAs/GaAs quantum well structure monolithically grown by metalorganic chemical vapour deposition on a low energy-plasma enhanced chemical vapour deposition graded misoriented Ge/Si virtual substrate", Optical Materials, Vol: 27, pp. 846–850 (2005).
95.	V.K. Yang, et al., "Comparison of luminescent efficiency of InGaAs quantum well structures grown on Si, GaAs, Ge, and SiGe virtual substrate", J. Appl. Phys., Vol: <b>93</b> (9), pp. 5095-5102 (2003).
96.	Shiu Fai Li, et al., "Scaling law for the compositional dependence of Raman frequencies in GeSi and SnGe alloys, Appl. Phys. Lett., Vol: 84, pp. 867-869 (2004).
97.	Cook, et al., "Optical constants and interband transitions of Ge1-xSnx alloys (x<0.2) grown on Si", In press Thin Solid Films, Vol: 455-456, pp. 217-221 (2004).
98.	Menendez, et al., "Type-I Ge/Ge <sub>1-x-y</sub> Si <sub>x</sub> Sn <sub>y</sub> strained-layer heterostructures with a direct Ge band gap, Appl. Phys. Lett., Vol: 85(7), pp. 1175-1177 (2004).
99.	Park, et al., "Observation olarge stark shift in Ge <sub>x</sub> Si <sub>1-x</sub> /Si multiple quantum wells", J. Cac. Sci. Technol. B, Vol: 8(2), pp. 217-220 (1990).
100.	Baier, et la., "Type-II band alignment in Si/Sil_xGex quantum wells from photoluminescence line shifts due to optically induced band-bending effects: Experiment and theory", Phys. Rev. B, Vol. 50(20), pp. 15191-15196 (1994).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(Nev. 2-32)	ratest and trademark office	05-720-US3	10/559,980
INFORMATION DISCL STATEMENT BY APP			
(Use several sheets if no	ecessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

101	Temkin, et al., "GexSi1-x strained-layer superlattice waveguide photodetectors operating near 1.3 _m", Appl. Phys. Lett., Vol: 48(15), pp. 963-965 (1986).
102	Li, et al., (2000), "Observation of quantum-confined stark shifts in SiGe/Si type-I multiple quantum wells", J. Appl. Phys. Vol: 87(11), pp. 8195-8197.
103	. Miyake, et al., "Absence of stark shift in strained Si1-xGex/Si type-I quantum wells", Appl. Phys. Lett., Vol; 68(15), pp. 2097-2099 (1996).
104	O. Qasaimeh, et al., (1997), "Electroabsorption and Electrooptic Effectin SiGe-Si Quantum Wells:  Realization of Low-Voltage Optical Modulators", IIEEE J. Quantum Electron, Vol: 33 (99), pp. 1532-1536.
105	Jaros, "Simple analytic model for heterojunction band offsets", Phys. Rev. B. Vol. 37(12), pp. 7112-7114 (1988).
106	Tolle, et al., "Epitaxial growth of group III nitrides on Si substrates via a reflective lattice-matched zirconium diboride buffer layer", Appl. Phys. Lett., Vol. 82(15), pp. 2398-2400 (2003).
107	Hu, et al., "Nucleation and growth of epitaxial ZrB <sub>2</sub> (0001) on Si(111)", Journal of Crystal Growth, Vol. 267, (2004) pp. 554-563.
108	Tolle, et al., "Epitaxial growth of AlGaN by metalorganic chemical vapor deposition on Si(111) via a ZrB <sub>2</sub> (0001) buffer layer", Appl. Phys. Lett, Vol: 84(18), pp. 3510-3512 (2004).
109	R.F.C. Farrow et al., "The growth of metastable, heteroepitaxial films of $\alpha$ -Sn by metal beam epitaxy", J. Cryst. Growth, Vol: 54, pp. 507-518 (1981).
110	G Becker et al., "Notiz uber eine einfache methode zur darstellung von tris (trimethylsilyl)phosphin", Chem. Ber., Vol: 108, pp. 2484-2485 (1975).
111	H. Schumann et al., "Trimethylsilyldiphosphane", J. Organomet. Chem., Vol: 88, pp. C13-C16, (1975).

EXAMINER	DATE CONSIDERED

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.
(Nev. 2-32) Fatelit allu Tradelliaik Office	05-720-US3	10/559,980	
INFORMATION DISCL STATEMENT BY APP			
(Use several sheets if ne	ecessary)		
		Applicant:	
		Kouvetakis, et al.	
		Filing Date:	Group:
		December 8, 2005	2812

112.	H. Schumann et al., "Eine einfache Methode zur Synthese von Organosilylphosphinen", J. Organometalic Chem. Vol: 55, pp. 257-260 (1973).
113.	H. Burger et al., "Schwingungsspektren und Kraftkonstanten von Silyl-und Trimethylsilyl-Verbindungen von Elementen der 5. Gruppe", Spectrochimica. Acta, Vol: 26A, pp. 671-683, (1970).
114.	H.J. Breunig et al., "Crystal structures of tris (trimethylsilyl) stibine and pentacarbonyl(tris(trimethylsilyl) stibine) chromium", Journal of Organometallic Chemistry, Vol: 608 (2000), pp. 60-62.
115.	L. Rosch et al., "Darstellung und untersuchung von phosphinkomplexen mit aluminiumtrichlorid und aluminiumtriathyl", Anorg. Allg. Chem, Vol. 426, pp. 99-106 (1976).
116.	H. Schumann et al., "Substituentenaustauschreaktionene zwischen Tris (Trimethylsilyl) phosphan und Trimethylgermanium- und Trimethylzinnchlorid", Z. Naturforsch., Vol:29B, 608-610 (1974).
117.	H. Schumann et al., "Darstellung und Schwingungsspektren von Trimethylsilyl-, Trimethylgermyl-und Trimethyl-stannyl-tert-butylphosphinen", Chem. Ber., Vol: 107, pp. 854-869 (1974).
118.	A.V.G. Engelhardt et al. Naturforsch., "Uber die IR-, Raman-und <sup>31</sup> P-NMR-Spektren ciniger phosphinderivate von germanium und zinn", B: Anorg. Chem., Org. Chem., Biochem, Biophys., Biol. Vol. 22b, pp. 352-353 (1967).
119.	J.W. Anderson, J.E. Drake, "Trimethylstannylarsines", Canadian Journal of Chemistry, Vol. 49, pp. 2524-2528 (1971).
120.	E. Niecke, H. Westermann, "A simple method for the preparation of Tris (trimethylsilyl) phosphine", Synthesis, (1988), page 330.
121.	H.J. Breunig et al., Naturforsch., "Tetrakis (Trimethylsilyl) distiban", Z. Naturforsch., Vol: 34B, pp. 926- 928 (1979).
122.	H.J. Breunig, "Synthese von Tetrakis (trimethylgermyl)-Distaiban", Z. Naturforsch., Vol: 33B, pp. 244-245, (1978).
123.	Spanier, et al., "The Synthesis of Germylsilane from Silane and German in a Silent Electric Discharge", Inorganic Chemistry, (1962), pp. 215-216

EXAMINER	DATE CONSIDERED

Sheet 13 of 13

FORM PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No.	Serial No.	
(Rev. 2-32)		Faterit and Trademark Office	05-720-US3	10/559,980
	INFORMATION DISCLO			
(	Use several sheets if nec	essary)		
			Applicant:	
			Kouvetakis, et al.	
			Filing Date:	Group:
			December 8, 2005	2812

## **COMMONLY OWNED CO-PENDING APPLICATIONS**

Examiner Initial		
initar	<u> </u>	
	1.	Kouvetakis, et al., U.S. Patent Application No. 10/559,981, Filed on December 8, 2005.
	2.	Kouvetakis, et al., U.S. Patent Application No. 10/559,979, Filed on December 8, 2005.

EXAMINER	DATE CONSIDERED